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EXAMINER

LU, KUEN S

ART UNIT PAPER NUMBER

2167

DATE MAILED: 03/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/059,233

Applicant(s)

NGO ET AL.

Examiner

Kuen S Lu

Art Unit

2167

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 November 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,5-110 and 113-123 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-2,5-110 and 113-123 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendments

1. The Action is responsive to the Applicant's Amendments, filed on November 10, 2004.
2. As for the Applicant's Remarks on claim rejections, filed on November 10, 2004, has been fully considered by the Examiner, please see discussion in the section ***Response to Arguments***, following the Office Action for Final Rejection. Please note the Examiner maintains the same grounds as set forth in the Office Action for non-Final Rejection, dated July 14, 2004.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-2, 5-12, 31-36, 38-76, 84-86, 97-110 and 113-123 are rejected are rejected under U.S.C. 103(a) as being unpatentable over Shih et al. (U.S. Patent 6,615,223, hereafter "Shih") in view of Neufeld et al. (U.S. Publication 2003/0126391, hereafter "Neufeld").

As per Claims 1, 109 and 114, Shih teaches the following:

“A method for replicating data at multiple devices” at Fig. 1, elements 2-74 and col. 4, lines 38-43 where data replication for two sites with device at each site is implemented, comprising the following steps:

representing “a data object at each of said devices by means of a graph of atoms in a store, where said graph includes at least one parent atom of a first type of atom” and “at least two descendant atoms of said first type” at Figs. 5 and 11, elements 96-98 and 102-104, and col. 8, lines 56-61 where an atom (element 104) is added to the graph of atoms in the LDAP structure. Further, the parent atom (element 98) contains information (element 104) pertaining to the adding of the data object and the data object (element 98) has two descendant objects, elements 102 and 104 of the same data type, LDAP class objects.

Shih does not specifically teach representing “the history of a data object” in the graph of atoms or the parent atom containing the “information pertaining to an operation performed on the data object”.

However, Neufeld teaches representing “the history of a data object” in the graph of atoms or the parent atom containing the “information pertaining to an operation performed on the data object” at Figs. 7A-7C and Pages 3-4, [0029] where a technique to store and make different versions of a file is illustrated. Further, the technique also uses a graph of atoms (the versions Version_1, version_2 and version_3 of the file) to illustrate the history of a data object (the file) and the parent atom (version_1) contain information pertaining the rewrite operation(s) performed on the object.

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention was made to combine Neufeld's reference with Shih's by preserving content and operation history performing on the data objects of Shih's replication system because the content and operation history of data objects in Shih's system is purged by a garbage collector module which is a daemon process periodically purging the change logs at the master and remote sites (col. 10, lines 45-49). Further, even if the change logs are preserved, the rollback or recovering process would have been tedious because it involves the processes of tracking the logs, opening files, reading files, database data manipulation operations and data replication to the remote site. It would have been a easier process by recovering the data objects to synchronize the systems to a pre-defined time frame.

Shih teaches "adding an atom of said first type to the atom graph in the store at a given device when an operation is performed on the data object at said given device" at Figs. 5 and 11 where atom (element 104) is added to the atom graph (the LDAP structure) when the operation of adding data object is performed; and updating "the data object at another device by transmitting to said other device at least one atom that is present in the store at said given device and absent from the store at said other device" at Figs. 5 and 11, and col. 9, line 42 – col. 10, line 8 where the atom 104 is added to the device of the master site, change log is copied to the replication log, the replication log is propagated to the remote site and the remote site server applies the change to the atom graph, the LDAP structure, by adding the data object to the device of the remote site.

Neufeld further teaches “updating the history of the data object at a second device by forming a new graph at said second device that is a strict superset of the of the atom graph that existed at said second device prior to said updating step, and a non-strict subset of the union of the atom graphs that existed at said first and second devices prior to said updating step” by using a graph of atoms (the versions of the file) to illustrate the history of a data object (the file) at Figs. 7A-7C and Pages 3-4, [0029].

As per Claims 2, 110 and 115, Shih teaches “updating step comprises forming the mathematical union of the atom graphs at said given device and said other device” at Figs. 5 and 11 and col. 10, lines 6-8 where the atom (element 104) is added to the atom graph of the master site and when the change under a synchronous replication is implemented to the atom graph at the remote site, an acknowledgement is sent back to the propagating LDPA site.

As per claims 5 and 113, Neufeld further teaches “two descendant atoms contain information that pertains to different respective versions of said data object” at Figs. 7A-7C where version_2 and version_3 are the two descendant atoms contain information that pertains to the parent, version_1.

As per claim 106, Neufeld further teaches “each of said parent atom and said descendant atoms contains a complete set of data for the version of the data object to which the atom pertains” at Figs. 7A-7C and Pages 3-4, [0029] where the parent and

descendant atoms (the versions Version_1, version_2 and version_3 of the file) contain a complete set of data for the version of the data object to which the atom pertains.

As per claim 107, Neufeld further teaches “a parent atom contains a complete set of data for the version of the data object to which the atom pertains, and descendant atoms contain information regarding differences between said complete set and the respective versions of the data object to which they pertain” at Figs. 7A-7C and Pages 3-4, [0029] where the parent version_1 is the parent atom contains a complete set of data for the version of the data object to which the atom pertains, and descendant atoms (version_2 and version_3 of the file) contain information regarding differences between said complete set and the respective versions of the data object to which they pertain.

As per claim 108, Neufeld further teaches “a descendant atom contains a complete set of data for the version of the data object to which the atom pertains, and a parent atom contains information regarding differences between said complete set and the version of the data object to which said parent atom pertains” at Figs. 7A-7C and Pages 3-4, [0029] where a descendant atom (version_2 or version_3) contains a complete set of data for the version of the data object to which the atom pertains, and a parent atom (version_1) contains information regarding differences between said complete set and the version of the data object to which said parent atom pertains.

As per claim 6, Shih teaches “atom graphs further include a second type of atom that contains information pertaining to an attribute of the data object” at Fig. 5 and col. 6, lines 54-64 where elements 100-101 are atoms of the object class “Person” which is a sub-class and an attribute of the parent atom object “Department”.

As per claim 7, Shih teaches “attribute comprises access rights for the data object” at col. 7, lines 59-64 where attributes include access and modification privileges for a particular object attribute.

As per claim 8, Shih teaches “attribute is an approval marking for the data object” at col. 8, lines 2-15 showing an attribute is an approval marking for the data object by stating that an operational attribute is maintained by system and is not normally permitted to modify the attribute value.

As per claim 9, Shih teaches “approval marking is a digital signature for the data object” at Fig. 4 and col. 7, lines 38-58 where the attribute table including the attribute entry ID, name, value and category is the software signature for access approval parking of the data objects.

As per claim 10, Shih teaches “the operation on the data object comprises a change in the contents of the data object” at col. 13, lines 1-25 where inbound changes include modifying information.

As per claim 11, Shih teaches “the operation on the data object includes deletion of the data object” at col. 13, lines 1-25 where inbound changes include deleting information.

As per claim 12, Neufeld further teaches “atom graph is directed, acyclic and connected, such that each atom associated with an operation on the data object is connected to at least one atom associated with a version of the object that existed prior to said operation” at Figs. 7A-7C and Pages 3-4, [0029] where atom graph of the parent and descendant atoms (the versions Version_1, version_2 and version_3 of the file) is directed, acyclic and connected, such that each atom associated with an operation on the data object is connected to at least one atom associated with a version of the object that existed prior to said operation. The change log is copied to replication log and transmitted to remote site for applying the changes (Fig. 3).

As per claims 31 and 121, Shih teaches “assigning an atom in a store to a bundle for transmission to another device during an update step” at col. 9, lines 18-54 and col. 11, line 39 – col. 12, line 29 where atom is added to a site and the change is entered as an entry to the change log, the bundle. The change log is copied to replication log and transmitted to remote site for applying the changes (Fig. 3).

As per claims 32 and 122, Shih teaches “plural atoms are assigned to a single bundle” at col. 9, lines 18-54 and col. 11, line 39 – col. 12, line 29 where atoms are added to a site and the changes is entered as entries to the change log, the bundle. The change log is copied to replication log and transmitted to remote site for applying the changes (Fig. 3).

As per claims 33 and 123, Shih teaches “the contents of an atom become fixed when it is assigned to a bundle, and subsequent operations on the data object result in the creation of a new atom” at col. 9, lines 18-54 and col. 11, line 39 – col. 12, line 29 where atom is added to a site and the change is entered as an entry to the change log, the bundle. Note Shih teaches adding an atom by inserting a data object to the master site where the data object added to the site is fixed (Shih: Fig. 4, col. 10, lines 16-38). The change log is copied to replication log and transmitted to remote site for applying the changes (Fig. 3).

As per claim 34, Shih teaches “a bundle is automatically created in a store in advance of a transmission containing said bundle” at col. 9, lines 18-54 and col. 11, line 39 – col. 12, line 29 where atom is added to a site and the change is automatically entered as an entry to the change log, the bundle. The change log is copied to replication log and transmitted to remote site for applying the changes (Fig. 3).

As per claim 35, Shih teaches “a bundle is created in a store in response to a request for a transmission from another store” at col. 13-14 where conflict resolution may need human intervention and request the remote site to re-transmitting the change log/replication log.

As per claim 36, Shih teaches “sends a list of its bundles to another store during said updating step” at col. 9, lines 18-54 and col. 11, line 39 – col. 12, line 29 where atoms are updated to a site and the changes is entered as entries to the change log, the bundle. The change log is copied to replication log and transmitted to remote site for applying the changes (Fig. 3).

As per claim 38, Shih teaches “a bundle is comprised of plural sheaves that form individual units for transmission” at col. 9, lines 18-54 and col. 11, line 39 – col. 12, line 29 where change of data is applied to a site and the change is entered as an entry to the change log, the bundle and the log is contains a plurality of entries.

As per claim 39, Shih teaches “one store sends a list of its sheaves to another store during said updating step” at col. 9, lines 18-54 and col. 11, line 39 – col. 12, line 29 where change of data is applied to a site and the change is entered as an entry to the change log, the bundle and the log is contains a plurality of entries.

As per claim 40, Shih teaches the bundle of entries at col. 9, lines 18-54 and col. 11, line 39 – col. 12, line 29 where change of data is applied to a site and the change is entered as an entry to the change log, the bundle and the log is contains a plurality of entries.

Shih does not specifically teach “assigning different levels of volatility to stores at different respective devices, and selectively deleting atoms in a bundle from a given store in accordance with its assigned level of volatility”.

However, Neufeld teaches “assigning different levels of volatility to stores at different respective devices, and selectively deleting atoms in a bundle from a given store in accordance with its assigned level of volatility” at Figs. 7A-7C and Pages 3-4, [0029] where the bundle is a plurality of file and further, Neufeld teaches a technique, based on the times a file has been re-written as a level of volatility, to store and make different versions of a file is illustrated.

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention was made to combine Neufeld's reference with Shih's by implementing level of volatility to the entries of the replication log file such that the entries be deleted in according to the value of the volatility level because by doing so the replication log size can be well maintained, and further, the level can be tied to the status when the entries are being applied, successfully applied and changes committed in order to efficiently to the phases of data replication.

As per claim 41, Neufeld further teaches “associating a volatility flag with each bundle, and setting the flag to identify the least volatile level of store in which a copy of the bundle is known to be stored” at Figs. 6A-6D and Page 3, [0028] where file is flagged by a combination of static and dynamic (non-volatile and volatile) status of the file and the region the file is stored.

As per claim 42, Neufeld further teaches “volatility flag is separately set at each store, and further including the step of resetting the flag as appropriate in response to data received during said updating step” at Figs. 6A-6D and Page 3, [0028] where file is flagged by a combination of static and dynamic (non-volatile and volatile) status of the file and the region the file is stored. The flag is reset if the file is moved from one region to another.

As per claim 43, Neufeld further teaches “one of said assigned levels is classified as volatile and another assigned level is classified as non-volatile, and wherein a bundle is identified for deletion from a volatile store when its volatility flag indicates that it has been stored in a non-volatile store” at Figs. 6A-6D and Page 3, [0028] where file is flagged by a combination of static and dynamic (non-volatile and volatile) status of the file and the region the file is stored. The flag is reset if the file is moved from one region to another.

As for claim 44, Neufeld further teaches “an atom comprises a content component and an identity component, and wherein the content component of the atom is deleted from a volatile store after it has been identified for deletion while its identity component is retained in the store” at Figs. 6A-6D and Page 3, [0028] where an atom is the file identified by a static or dynamic (non-volatile and volatile) of the region it is stored and its content component is flagged by its static or dynamic (non-volatile and volatile) status of the file.

As per claim 101, Neufeld further teaches “a bundle includes a completeness flag, and further including the step of setting said completeness flag to indicate whether the atoms of a bundle include their content component” at Figs. 6A-6D and Page 3, [0028] where the completeness flag is the combination of static or dynamic (non-volatile and volatile) of file content and its store.

As per claim 45, Neufeld further teaches “an atom comprises a content component and an identity component, and wherein both components are deleted from a volatile store after the atom has been identified for deletion” at Figs. 6A-6D and Page 3, [0028] where both content and store components are identified for deletion is by the setting dynamic (volatile) flag to both of the file and the region it is stored.

As per claim 46, the combined Neufeld-Shih reference teaches “another assigned level is classified as final, to which an atom is transmitted during an end-of-life process”

by appending the AttrKind field with the flag value when the entry in the attribute store table is successfully applied and committed to the remote site (Shih: Figs. 3-4, elements 314-316, 320, 310, 324 and 322 and col. 9, lines 15-27, and Neufeld: Figs. 6A-6D, Page 3, [0028]).

As per claim 47, the combined Neufeld-Shih reference teaches “an atom comprises a content component and an identity component, and wherein both components are deleted from the volatile and non-volatile stores after the atom has been transmitted to a final store” by using garbage to purge the entries of the change log that have already been applied or have already been dropped (Shih: col. 12, lines 12-29).

As per claim 102, the combined Neufeld-Shih reference teaches “an end-of-life process includes the steps of broadcasting the final store's inventory and a notification that the end-of-life process is taking place” by acknowledging the entry of replication log is applied to the remote site under a synchronous replication scheme (Shih: col. 9, line 61 – col. 10, line 8).

As per claim 103, the combined Neufeld-Shih reference teaches “in response to receipt of said broadcast, the stores other than said first store perform an updating operation with said final store” by a daemon process which wakes up periodically to initiate changes and the operation is responding the daemon process (Shih: col. 9, line 61 – col. 10, line 8).

As per claim 104, the combined Neufeld-Shih reference teaches “including the step of setting the volatility flags in said other stores to indicate that a bundle has been updated to the final store” by identifying the content of the file and the region of store and setting dynamic (volatile) flag to both of the file and the region it is stored (Neufeld: Figs. 6A-6D and Page 3, [0028]).

As per claim 105, the combined Neufeld-Shih reference teaches “including the step of deleting the bundles in said other stores whose volatility flags have been set to a final value” by a garbage collector module which is a daemon process periodically purging the change logs at the master and remote sites (Shih: col. 10, lines 45-49, Neufeld: Figs. 6A-6D and Page 3, [0028]).

As per claims 48 and 116, Shih teaches “updating step comprises the transmission of information pertaining to atoms from a sender store to a receiver store” at Fig. 3, elements 314-316, 320, 320, 324 and 322, and col. 11, line 39 – col. 12, line 29 where a new atom (node) is added to a master site and replicated at the remote site.

As per claims 49 and 117-118, Shih teaches “information is transmitted by means of a synchronous communications network” at col. 1, lines 22-52 where a synchronous replication scheme is described.

As per claims 50 and 119, Shih teaches "information is transmitted by means of a file that is attached to an e-mail message" at Fig. 3 and col. 25, lines 7-25 where communication is implemented in various forms and processing unit is able to send and receive message, and further the replication change log is transmitted from master site to the remote site.

As per claims 51 and 120, Shih teaches "information is transmitted by means of a file that is stored on a removable medium" at col. 23, lines 24-34 where floppy disk and flexible disks are implemented as an input device to the host of a replication site.

As per claim 52, the combined Neufeld-Shih references teaches the following:

"the recipient store requests an update, and sends a first inventory of the bundles that it currently contains" when the first replication site requests change and change is replicated to the remote site (Shih: col. 4, line 61 – col. 5, line 5);

"the recipient store sends a list of the volatility flags for its bundles" where changes are made to a master site, stored to the change log and copied to the replication log wherein entries to the file are flagged (Shih: Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8, Neufeld: Figs. 6A-6D);

"the sender store sends a second inventory of the bundles that it has but the recipient does not have" where changes are made to a master site, stored to the change log and copied to the replication log wherein entries to the file are flagged (Shih: Figs. 3-4,

elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8, Neufeld: Figs. 6A-6D);

“the sender sends a list of volatility flags for its bundles” where changes are made to a master site, stored to the change log and copied to the replication log wherein entries to the file are flagged (Shih: Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8, Neufeld: Figs. 6A-6D); and

“the sender store transmits the bundles in said second inventory” when the master site transmits replication log file to the remote site (Shih: elements 316 and 320, and col. 9, lines 43-60).

As per claim 53, Shih teaches “the step wherein the recipient store responds with a list that represents the bundles that are to be received from the sender, after the sender store sends an inventory of the bundles that it has but the recipient does not have” at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where the master site stores changes to the change log after changes are requested and the remote site receives replication log which stores the entries of changes to be replicated. Note the data change at one site is to be replicated to the remote site which does not have the change before change is replicated over.

As per claim 54, Shih teaches “the recipient store responds with a list of the bundles that it received and added to its atom graphs” at Figs. 5 and 11, elements 98, 102-104 where new atom (element 104) is added to the graph of atoms.

As per claim 55, the combined Neufeld-Shih reference teaches the following:

“the sender store caches a copy of a recipient's bundle inventory” by receiving the bundle, the replication log, of changes made to the recipient site (Shih: Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8);

“the sender store transmits a bundle inventory showing what it has and what it assumes the recipient store does not have, based upon its cached copy of the recipient's bundle inventory” by replicating changes between the master and remote sites where a replication made to one site is the change the other site does not have before data is replicated over;

“the sender store transmits its bundle volatility list; and ‘the sender store transmits the bundles” where entries stored in the replication log contains entries of changes already made and the entries are flagged by using the Attrkind filed (Shih: Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8, Neufeld: Figs. 6A-6D);

As per claim 56, Shih teaches “the step in which the sender store transmits an inventory of its bundles, for future reference” at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where replication log is transmitted from the master to the remote site.

As per claim 57, Shih teaches “the step in which a recipient store broadcasts an inventory of its bundles prior to said steps performed by the sender store” at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where changes made to the replication sites are stored in the replication log and transmitted between the sites and an acknowledge is sent back to the originating site when the replication scheme is synchronous.

As per claim 58, the Neufeld-Shih combined reference teaches “at least one store does not have an assigned level of volatility” by storing owner value to the AttrKind field of attribute store table (Shih: Fig. 4) and the volatility level is implemented in the file and its store’s dynamic and static status flags (Neufeld: Figs. 6A-6D).

As per claim 59, the Neufeld-Shih combined reference teaches “one store is capable of receiving data objects from other stores, but is inhibited from replicating data objects to stores that have assigned levels of volatility” at col. 13, lines 19-25 where conflicts need to be resolved before data replication can be applied to the other site and conflicts include adding entry to an already existed one, and deleting or modifying a non-existing entry.

As per claim 60, Shih teaches “updating step comprises the transmission of information pertaining to atoms from a sender store to a receiver store” at Figs. 5 and

11, and col. 9, line 28 – col. 10, line 8 where update of an atom, the LDAP entry, in a master site is replicated to the remote site.

As per claim 61, Shih teaches the following:

“the recipient store requests an update, and sends a first inventory of the bundles that it currently contains” at Figs. 5 and 11, and col. 9, line 28 – col. 10, line 8 where update of an atom, the LDAP entry, is stored in an entry of the replication log and sent to the other site;

“the sender store sends a second inventory of the bundles that it has but the recipient does not have” at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where the master site stores changes to the change log after changes are requested and the remote site receives replication log which stores the entries of changes to be replicated. Note the data change at one site is to be replicated to the remote site which does not have the change before change is replicated over.
; and

“the sender store transmits the bundles in said second inventory” at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where changes are entries sequentially entered into the change log and copied to the replication log before being transmitted to the remote site.

As per claim 62, Shih teaches “the recipient store responds with a list that represents the bundles that are to be received from the sender, after the sender store sends an

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inventory of the bundles that it has but the recipient does not have” at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where changes are entries sequentially entered into the change log and copied to the replication log before being transmitted to the remote site.

As per claim 63, Shih teaches “the recipient store responds with a list of the bundles that it received and added to its atom graphs” at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, Figs. 5 and 11, elements 98, 102 and 104, and col. 11, line 39 – col. 12, line 29 where atom is added to one site is replicated to the remote site.

As per claim 64, the combined Neufeld-Shih reference teaches the following:

“the sender store caches a copy of a recipient's bundle inventory” by receiving the bundle, the replication log, of changes made to the recipient site (Shih: Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8);

“the sender store transmits a bundle inventory showing what it has and what it assumes the recipient store does not have, based upon its cached copy of the recipient's bundle inventory” by replicating changes between the master and remote sites where a replication made to one site is the change the other site does not have before data is replicated over;

“the sender store transmits its bundle volatility list; and ‘the sender store transmits the bundles” where entries stored in the replication log contains entries of changes already made and the entries are flagged by using the Attrkind filed (Shih: Figs. 3-4, elements

314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8, Neufeld: Figs. 6A-6D);

As per claim 65, Shih teaches "the step in which the sender store transmits an inventory of its bundles, for future reference" at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where replication log is transmitted from the master to the remote site.

As per claim 66, Shih teaches "the step in which a recipient store broadcasts an inventory of its bundles prior to said steps performed by the sender store" at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where changes made to the replication sites are stored in the replication log and transmitted between the sites and an acknowledge is sent back to the originating site when the replication scheme is synchronous.

As per claim 67, Shih teaches "updating step comprises the transmission of information pertaining to atoms from a sender store to a receiver store" at Fig. 3, elements 314-316, 320, 320, 324 and 322, and col. 11, line 39 – col. 12, line 29 where a new atom (node) is added to a master site and replicated at the remote site.

As per claim 68, Shih teaches "information is transmitted by means of a synchronous communications network" at col. 1, lines 22-52 where a synchronous replication scheme is described.

As per claim 69, Shih teaches "information is transmitted by means of a file that is attached to an e-mail message" at Fig. 3 and col. 25, lines 7-25 where communication is implemented in various forms and processing unit is able to send and receive message, and further the replication change log is transmitted from master site to the remote site.

As per claim 70, Shih teaches "information is transmitted by means of a file that is stored on a removable medium" at col. 23, lines 24-34 where floppy disk and flexible disks are implemented as an input device to the host of a replication site.

As per claim 71, the combined Neufeld-Shih references teaches the following:
"the recipient store requests an update, and sends a first inventory of the atoms that it currently contains" when the first replication site requests change and change is replicated to the remote site (Shih: col. 4, line 61 – col. 5, line 5);
"the recipient store sends a list of the volatility flags for its atoms" where changes are made to a master site, stored to the change log and copied to the replication log wherein entries to the file are flagged (Shih: Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8, Neufeld: Figs. 6A-6D);

“the sender store sends a second inventory of the atoms that it has but the recipient does not have” where changes are made to a master site, stored to the change log and copied to the replication log wherein entries to the file are flagged (Shih: Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8, Neufeld: Figs. 6A-6D);

“the sender sends a list of volatility flags for its atoms” where changes are made to a master site, stored to the change log and copied to the replication log wherein entries to the file are flagged (Shih: Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8, Neufeld: Figs. 6A-6D); and

“the sender store transmits the atoms in said second inventory” when the master site transmits replication log file to the remote site (Shih: elements 316 and 320, and col. 9, lines 43-60).

As per claim 72, Shih teaches “the step wherein the recipient store responds with a list that represents the atoms that are to be received from the sender, after the sender store sends an inventory of the atoms that it has but the recipient does not have” at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where the master site stores changes to the change log after changes are requested and the remote site receives replication log which stores the entries of changes to be replicated. Note the data change at one site is to be replicated to the remote site which does not have the change before change is replicated over.

As per claim 73, Shih teaches “the recipient store responds with a list of the atoms that it received and added to its atom graphs” at Figs. 5 and 11, elements 98, 102-104 where new atom (element 104) is added to the graph of atoms.

As per claim 74, the combined Neufeld-Shih reference teaches the following:
“the sender store caches a copy of a recipient's atom inventory” by receiving the change, the replication log, of changes made to the recipient site (Shih: Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8);
“the sender store transmits an atom inventory showing what it has and what it assumes the recipient store does not have, based upon its cached copy of the recipient's atom inventory” by replicating changes between the master and remote sites where a replication made to one site is the change the other site does not have before data is replicated over;
“the sender store transmits its atom volatility list; and ‘the sender store transmits the atoms” where entries stored in the replication log contains entries of changes already made and the entries are flagged by using the Attrkind filed (Shih: Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8, Neufeld: Figs. 6A-6D);

As per claim 75, Shih teaches “the step in which the sender store transmits an inventory of its atoms, for future reference” at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where replication log is transmitted from the master to the remote site.

As per claim 76, Shih teaches “the step in which a recipient store broadcasts an inventory of its atoms prior to said steps performed by the sender store” at Figs. 3-4, elements 314-316, 320, 320, 324 and 322, and col. 9, line 28 - col. 10, line 8 where changes made to the replication sites are stored in the replication log and transmitted between the sites and an acknowledge is sent back to the originating site when the replication scheme is synchronous.

As per claim 84, Neufeld further teaches “stores is associated with a space that pertains to a set of information, and different ones of said stores are respectively associated with different spaces” at Figs. 6A-6D where each version of a file is associated with a specific space of different file/store flag combinations.

As per claim 85, Neufeld further teaches “a data object is a member of plural spaces” at Figs. 6A-6D where each version of a file is associated with a specific space in a plurality of spaces.

As per claim 86, the combined Neufeld-Shih reference teaches “detecting the addition of an atom to the atom graph for said data object, and designating said added atom for transmission to stores associated with all of the spaces of which said data object is a member” by adding atom to a graph of atoms (Shih: Figs. 5 and 11 where

elements 104 is the atom added to the graph of atoms) and the atom, a version of a file, is associated with a store (Neufeld: Figs. 6A-6D).

As per claim 97, Shih teaches “stores are present at a multiplicity of devices, and a store at any device is capable of performing said updating step with a store at any other device” at Fig. 1, and col. 4, lines 37-43 and col. 23, lines 24-34 where a multiplicity of devices is supported at a store for performing data replication at a plurality of sites.

As per claim 98, Shih teaches the following:

“performance of said updating step between a first store and a second stores results in a conflict” at col. 4, lines 37-43 and cols. 13-14, lines 1-28 where a replication for more than two sites and conflict resolution is described.

“a) performing an update between a third store and one of said first and second stores” at col. 13, lines 12-15 where a multi-master replication enables updates to multiple replication sites;

“b) detecting and resolving said conflict at said third store” at col. 4, lines 37-43, col. 14, lines 24-67 and col. 15, line 1 – col. 19, line 14 where change/conflict procedure is applied to a data replication site in a replication scheme of three or more sites; and

“c) performing an update between said third store and each of said first and second stores, to thereby resolve said conflict at said first and second stores” at col. 4, lines 37-43, col. 14, lines 24-67 and col. 15, line 1 – col. 19, line 14 where change/conflict procedure is applied to a data replication site in a replication scheme of three or more

sites and further, human intervention queue can be applied to any site or pairing of sites.

As per claim 99, Shih teaches “the update of step (c) is carried out directly between said third store and at least one of said first and second stores” at col. 13, lines 12-15 where a multi-master replication enables updates to multiple replication sites and at col. 4, lines 37-43, col. 14, lines 24-67 and col. 15, line 1 – col. 19, line 14 where change/conflict procedure is applied to a data replication site in a replication scheme of three or more sites and further, human intervention queue can be applied to any site or pairing of sites.

As per claim 100, Shih teaches “update of step (c) between said third store and at least one of said first and second stores is carried out indirectly by way of an intermediary store” at col. 13, lines 12-15 where a multi-master replication enables updates to multiple replication sites and at col. 4, lines 37-43, col. 14, lines 24-67 and col. 15, line 1 – col. 19, line 14 where change/conflict procedure is applied to a data replication site in a replication scheme of three or more sites and further, human intervention queue can be applied to any site or pairing of sites.

5. Claims 13-30 are rejected are rejected under U.S.C. 103(a) as being unpatentable over Shih et al. (U.S. Patent 6,615,223, hereafter “Shih”) in view of Neufeld et al. (U.S. Publication 2003/0126391, hereafter “Neufeld”), as applied to Claims 1-2, 5-12, 31-36,

38-76, 84-86, 97-110 and 113-123 above, and further in view of Zias et al. (U.S. Patent 5,734,852, hereafter "Zias").

As per claim 13, the combined Neufeld-Shih reference teaches data replication by using graph of atoms to represent the replicated objects as described in claim 1 rejection above.

The combined Neufeld-Shih reference does not teach using a cursor to identify one atom in the graph, although Neufeld teaches using a pointer to identify an object in the graph at Fig. 7C where element 705 is a pointer points to the current version of the file.

However, Zias teaches a cursor to control data object at Fig. 5, elements 514, 516, 520 and 522, and col. 11, lines 15-26 where window objects are controlled and drawn by the cursor.

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention was made to combine Zias' reference with Neufeld and Shih's by using cursor to associate with data objects in the graph of atoms because by doing so the application program would have enabled Shih's system to have the flexibility to graphically associate, manipulate and control the data objects under display as represented by atoms in the graph (Zias: col. 4, lines 17-26).

As per claim 14, Zias further teaches "the cursor determines a view of the object that is presented by an application at said device" at Fig. 5, elements 500-522 where view of

objects (elements 504-506 and 514-518) is presented in the view system and controlled by the cursors.

As per claim 15, the combined Neufeld-Shih reference teaches presenting data objects at different devices (Shih: Fig. 1, elements 4 and 54 and Fig. 11, elements 96-104).

The combined Neufeld-Shih reference does not teach views of the same object are represented by applications.

However, Zias further teaches views of the object presented by application.

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention was made to combine Zias' reference with Neufeld and Shih's by presenting different views of the same object by applications at different respective devices because the combination of reference would have enabled the Shih's system to have the flexibility to graphically associate, manipulate and control the data objects under display as represented by atoms in the graph (Zias: col. 4, lines 17-26) at devices of both the master and remote replication sites (Shih: Fig. 1, elements 4 and 54).

As per claim 16, Neufeld further teaches "wherein an atom graph has plural cursors which identify at least two different respective atoms in the graph as a result of an update, and further including the step of presenting a view of each version of the data object represented by the respective identified atoms for conflict resolution" at Fig. 7C where elements 705, 706 and 708 are pointers point to the different versions of the file.

As per claim 17, Zias teaches “the step of generating metadata pertaining to a data object, and assigning said cursor to an atom by applying business rules to said metadata” at Fig. 5, elements 500-522 where view of objects (elements 504-506 and 514-518) is presented in the view system and controlled by the cursors and the views are the metadata.

As per claims 18 and 25, Zias further teaches “metadata is generated at a store when an atom is created at that store” at Fig. 5, elements 500-522 where view of objects (elements 504-506 and 514-518) is presented in the view system and controlled by the cursors and the views are the metadata.

As per claims 19 and 26, Shih teaches “step of transmitting the metadata created at a store to other stores during said updating step” at col. 9, line 42 – col. 10, line 45 where data change at master site is replicated to remote site with metadata change replicated accordingly.

As per claims 20 and 27, Shih teaches “wherein a given store applies the business rules to metadata generated at that store and to metadata received from other stores” at Fig. 7, elements 714-715 and col. 25, lines 16-25 where program, applications and messages are transmitted and received between the master and remote sites.

As per claims 21 and 28, Shih teaches “metadata includes a time stamp for the creation of an atom, and said business rules assign the cursor on a time-related basis” at col. 8, lines 9-16 and col. 9, line 42 – col. 10, line 45 where timestamp when a data object last modified by application is maintained, and further, the change is replicated to remote site .

As per claims 22 and 29, Shih teaches “metadata includes an indication of a person who was responsible for the creation of an atom, and said business rules assign the cursor on a trust-related basis” at Fig. 4 and col. 7, line 59 – col. 8, line 16 where attribute tables for data objects include the column for storing information of the identity which modifies the data object.

As per claims 23 and 30, Zias further teaches “business rules assign the cursor on an application-specific basis” at Fig. 5, elements 500-522 and col. 10, lines 13-24 where view of objects (elements 504-506 and 514-518) is presented in the view system and controlled by the cursors and the objects in the windows are created by applications while applications is the implementation of business rules.

As per claims 24, the combined –Neufeld-Shih reference teaches “the steps of generating metadata pertaining to a data object” by creating metadata in the data dictionary to describe data objects (Shih: col. 4, lines 44-53).

The combined reference does not specifically teach “applying business rules to said metadata at a store to determine a current view of the object that is presented by an application”.

However, Zias teaches “applying business rules to said metadata at a store to determine a current view of the object that is presented by an application” at Fig. 7 and col. 12, lines 13-24 where classes of objects in the view system which are available for application programs, an implementation of business rules.

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention was made to combine Zias' reference with Neufeld and Shih's by presenting different views of the same object by applications at different respective devices because the combination of reference would have enabled the Shih's system to have the flexibility to graphically view, associate, manipulate and control the data objects under display as represented by atoms in the graph (Zias: col. 4, lines 17-26).

6. Claim 37 is rejected are rejected under U.S.C. 103(a) as being unpatentable over Shih et al. (U.S. Patent 6,615,223, hereafter “Shih”) in view of Neufeld et al. (U.S. Publication 2003/0126391, hereafter “Neufeld”), as applied to Claims 1-2, 5-12, 31-36, 38-76, 84-86, 97-110 and 113-123 above, and further in view of Shuttleworth et al. (U.S. Publication 2003/0130882, hereafter “Shuttleworth”).

As per claim 37, the combined Neufeld-Shih reference teaches sending replication bundle to the remote site as previously described for rejecting claim 36.

The combined Neufeld-Shih reference does not teach “the bundles in said list are run-length encoded”

However, Shuttleworth teaches using run-length bit-wise encoded representation for compressing data for efficiently transmitted.

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention was made to combine Shuttleworth' reference with Neufeld and Shih's by using run-length bit-wise encoded representation to compress replication log before transmitting to the remote site because both references are devoted to peer-to-peer network communication. An algorithm for efficiently transmitting data between the master and remote sites would have improved Shih's system performance, especially for a synchronous replication where a seamless sending and receiving replication log is extremely important to the success of replication scheme.

7. Claims 77-83 are rejected are rejected under U.S.C. 103(a) as being unpatentable over Shih et al. (U.S. Patent 6,615,223, hereafter “Shih”) in view of Neufeld et al. (U.S. Publication 2003/0126391, hereafter “Neufeld”), as applied to Claims 1-2, 5-12, 31-36, 38-76, 84-86, 97-110 and 113-123 above, and further in view of Dutta (U.S. Publication 2002/0138447).

As per claim 77, the combined Neufeld-Shih reference teaches data replication by using graph of atoms to represent the replicated objects as described in claim 1 rejection above.

The combined Neufeld-Shih reference does not teach encrypting information pertaining to an atom using a public-private key pair.

However, Dutta teaches encrypting client data packet by a public-key/private-key pair encryption at Page 3, [0034].

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention was made to combine Dutta's reference with Neufeld and Shih's by encrypting data pertaining to an atom because data replication between master and remote sites is implemented over an internet where replicated data transmitting across the network may involve confidential information and validation of users only may not be sufficient to protect the confidentiality of data. An encryption of replicated data would have enabled Shih's system better fit for dealing with confidential data, such as medical and financial information.

As per claim 78, Dutta further teaches "information is encrypted on a per-atom basis" at Page 3, [0034] where data is encrypted on data packet.

As per claim 79, Dutta further teaches "the private key of said pair is held by only one person" at Page 3, [0034] where private key is only held by the client.

As per claim 80, Dutta further teaches "the private key of said pair is held by a plurality of people" at Page 3, [0034] by stating "Only the client has the private key".

As per claim 81, Dutta further teaches “storing the public key in the store in association with the atom graph, and providing said public key to said other device during said update step” at Page 3, [0034] where computer system can obtain the client’s public key for deciphering data packets for verifying that indeed the client was the computing device to encrypt the key.

As per claim 82, Dutta further teaches “atom graph includes a validation atom that validates a revision to the public key and is digitally signed with a private key” at Page 3, [0034] where client’s public key is used to decipher data packets for providing digital signature to verify that indeed the client was the computing device to encrypt the key.

As per claim 83, Dutta further teaches “atom graph includes a revocation atom that revokes the public key and is digitally signed with a private key” at Page 3, [0034] by using established public key security mechanisms, such as digital certificates and third party certificates revocation list servers and associated certificate authorities to verify the identity of the client.

8. Claims 87 and 91-94 are rejected are rejected under U.S.C. 103(a) as being unpatentable over Shih et al. (U.S. Patent 6,615,223, hereafter “Shih”) in view of Neufeld et al. (U.S. Publication 2003/0126391, hereafter “Neufeld”), as applied to claims 1-2 and 5-12 above, and further in view of Chao et al. (U.S. Publication 2001/0037398, hereafter “Chao”).

As per claim 87, the combined Neufeld-Shih reference teaches data replication by using graph of atoms to represent the replicated objects as described in claim 1 rejection above.

The combined Neufeld-Shih reference does not teach “one store is associated with a hub device, and said updating step is carried out unidirectionally from the store at said hub device to all of the other stores”.

However, Chao teaches “one store is associated with a hub device, and said updating step is carried out uni-directionally from the store at said hub device to all of the other stores” at Fig. 2B, elements 10 and 12b’s and Pages 2, [0024] and 3, [0047] where each of the originating nodes sends update to the central hub and the central hub device is prepared for broadcasting and replicating changes to other nodes.

It would have been obvious to one having ordinary skill in the art at the time of the applicant’s invention was made to combine Chao’s reference with Neufeld and Shih’s by using a hub device to centralize all data changes and replicate the changes to other sites because by doing so a replication scheme of a plurality of nodes would have been able to reduce network traffic, update changes by batch and efficiently replicate changes to a large number of nodes.

As per claim 91, Chao further teaches “updating step is performed by pushing information pertaining to said atoms from said hub device to said other stores” at Fig. 2B, elements 10 and 12b’s and Pages 2, [0024] and 3, [0047] where each of the

originating nodes sends updated information pertaining to data object to the central hub and the central hub device is prepared for broadcasting and replicating changes to other nodes.

As per claim 92, Chao further teaches “updating step is initiated by sending a request from said other stores to said hub device” at Fig. 2B, elements 10 and 12b’s and Pages 2, [0024] and 3, [0047] where each of the originating nodes sends updated information pertaining to data object to the central hub and the central hub device is prepared for broadcasting and replicating changes to other nodes.

As per claim 93, Chao further teaches “a first updating step is performed uni-directionally from said hub device to a first set of intermediate stores, and a second updating step is performed uni-directionally from said intermediate stores to other stores” at Fig. 4, elements 10, 35, 31 and 12e where data is replicated from hub device to a remote node and further replicated to the second remote node.

As per claim 94, Chao further teaches “one store is associated with a hub device, and said updating step is carried out bi-directionally between the store at said hub device and all of the other stores” at Fig. 4, elements 10, 35, 31 and 12e where data is replicated from hub device to a remote node and further replicated to the second remote node.

9. Claims 88-90 and 95-96 are rejected are rejected under U.S.C. 103(a) as being unpatentable over Shih et al. (U.S. Patent 6,615,223, hereafter "Shih") in view of Neufeld et al. (U.S. Publication 2003/0126391, hereafter "Neufeld") and Chao et al. (U.S. Publication 2001/0037398, hereafter "Chao"), as applied to Claims 87 and 91-94 above, and further in view of Zias et al. (U.S. Patent 5,734,852, hereafter "Zias").

As per claim 88, the combined Chao-Neufeld-Shih reference teaches data replication by using a central hub for broadcasting changes to other nodes as described in claim 87 rejection above.

The combined Chao-Neufeld-Shih reference does not teach using a cursor to identify one atom in the graph, although Neufeld teaches using a pointer to identify an object in the graph at Fig. 7C where element 705 is a pointer points to the current version of the file.

However, Zias teaches a cursor to control data object at Fig. 5, elements 514, 516, 520 and 522, and col. 11, lines 15-26 where window objects are controlled and drawn by the cursor.

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention was made to combine Zias' reference with Chao, Neufeld and Shih's by using cursor to associate with data objects in the graph of atoms where data replication is centralized by a hub device because by doing so the application program would have enabled Shih's system to have the flexibility to graphically associate,

manipulate and control the data objects under display as represented by atoms in the graph (Zias: col. 4, lines 17-26).

As per claim 89, the combined Chao-Neufeld-Shih reference teaches hub device for centralizing data changes to replicate to other nodes (Chao: at Fig. 2B, elements 10 and 12b's and Pages 2, [0024] and 3, [0047]).

The combined reference does not teach "the cursor is assigned at said hub device, and said assignment is transmitted to said other stores from the hub device during said updating step".

However, Zias teaches view of objects (elements 504-506 and 514-518) is presented in the view system and controlled by the cursors and the views are the metadata at Fig. 5.

It would have been obvious to one having ordinary skill in the art at the time of the applicant's invention was made to combine Zias' reference with Chao, Neufeld and Shih's by using cursor to associate with data objects in the graph of atoms where data replication is centralized by a hub device because by doing so the application program would have enabled Shih's system to have the flexibility to graphically associate, manipulate and control the data objects under display as represented by atoms in the graph (Zias: col. 4, lines 17-26).

As per claim 90, the combined Zias-Chao-Neufeld-Shih further teaches "notifying users at devices other than said hub device that a revision has been made to a data

object, and enabling said users to assign the cursor at said other devices” where view of objects (elements 504-506 and 514-518) is presented in the view system and controlled by the cursors and further, the user is notified when viewing the cursor is revised to drag a data object (Zias: Fig. 5, elements 500-522, 504-506 and 514-518).

As per claim 95, the combined Zias-Chao-Neufeld-Shih further teaches “an atom graph at each store has a cursor that identifies an atom pertaining to a current version of the data object” where view of objects (elements 504-506 and 514-518) is presented in the view system and controlled by the cursors (Zias: Fig. 5, elements 500-522, 504-506 and 514-518).

As per claim 96, the combined Zias-Chao-Neufeld-Shih further teaches “the atom identified by the cursor can only be changed at said hub device, and said change is transmitted to said other stores from the hub device during an updating step” where view of objects (elements 504-506 and 514-518) is presented in the view system and controlled by the cursors (Zias: Fig. 5, elements 500-522, 504-506 and 514-518) and further, the changes are replicated from the hub device to other nodes (Chao: Fig. 2B, elements 10 and 12b's).

10. The prior art made of record

- A. U.S. Patent No. 6,615,223
- B. U.S. Publication 2003/0126391
- C. U.S. Patent No. 5,734,852

D. U.S. Publication 2003/0130882

E. U.S. Publication 2002/0138447

F. U.S. Publication 2001/0037398

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

G. U.S. Patent No. 6,144,999

H. U.S. Publication 2004/0034670

Response to the Arguments

11. The Applicants' arguments filed on November 10, 2004 have been fully considered but they are not persuasive, for the Examiner's response, please see discussion below.

a). At Pages 2-3, concerning claim 1, the Applicant argued that the Shih reference (U.S. Patent 6,615,223) does not teach a graph of atoms.

As to the above argument, the Examiner respectfully disagreed. The Examiner interprets the objects in a LDAP structure as the atoms. It is the Examiner's opinion that the object in the LDAP tree structure representing "a data object at each of said devices by means of a graph of atoms in a store, where said graph includes at least one parent atom of a first type of atom". Please note the Examiner reveal the atom graph of the Application has the same tree structure as the LDAP structure.

b). At Pages 5-6, concerning claim 1, the Examiner argued that the teachings of Neufeld (U.S. Publication 2003/0126391, on multiple versions of file re-write to file system) and Shih (on replication) are of different fields and the combination does not

teach the history of a data object pertaining to an operation performed on the data object.

As to the above argument, the Examiner respectfully disagreed. Concerning the combination of the two references, the Applicant argued about the three basic criteria to be met for establishing a prima facie case of obviousness. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Shih reference teaches data object in each of the device by means of a graph of atoms as previously described, while Neufeld reference teaches a history of a data object by storing and making different versions of a file, an object. Please note the versions of file are continuous, and the attributes of the file recording operation performed on the file represents a history of the object. Further, there may be only one or a plurality of atomic operations performed on a file to move it from one version to the next. The Examiner respectfully agreed that Shih and Neufeld are of different fields, however, both reference are dedicated to manage data objects and both concern about purging data object for maintaining efficient utilization of storage. Also please note the Application also share the same concern. The common

dedication and shared concern of the references provides the motivation to combine the references.

c). At Page 7, concerning claims 2, 110 and 115, the Applicant argued that Shih reference does not adding an atom to an atom graph because Shih teaches only a single tree and there is no second tree.

As to the above argument c), the Examiner respectfully disagree. A tree is a data structure may start from a root node or other nodes. A tree may have one or a plurality of levels. Taking Figure 5 of Shih reference as an example, there are trees starting at nodes 96, 97, 98 and 99, respectively.

12. In light of the forgoing arguments, the 35 U.S.C. 103 rejections for claims 1-2, 5-110 and 113-123 is hereby sustained.

Conclusions

13. THIS ACTION IS MADE FINAL.

The Applicants are reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. The prior art made of record, listed on form PTO-892, and not relied upon, if any, is considered pertinent to applicant's disclosure.


If a reference indicated as being mailed on PTO-FORM 892 has not been enclosed in this action, please contact Lisa Craney whose telephone number is 571-272-3574 for faster service.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kuen S Lu whose telephone number is 571-272-4114.

The examiner can normally be reached on 8 AM to 5 PM, Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Breene can be reached on 571-272-4107. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2100.

Kuen S. Lu

Patent Examiner

March 4, 2005


Luke Wassum

Primary Examiner

March 4, 2005